



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/846,127	04/30/2001	Zhizhang Chen	10007794-1	5243

7590 05/08/2002

HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, CO 80527-2400

EXAMINER

LEWIS, MONICA

ART UNIT PAPER NUMBER

2822

DATE MAILED: 05/08/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/846,127

Applicant(s)

CHEN ET AL.

Examiner

Monica Lewis

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 March 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 and 21-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 and 21-40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 April 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

1. This action is in response to the election filed March 11, 2002.

Election/Restrictions

2. Claims 18-20 and 41-71 withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 7.

Drawings

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: 36 (See Figure 2). A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

4. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.
5. The abstract of the disclosure is objected to because of the following grammatical error "within in which". Correction is required. See MPEP § 608.01(b).

Claim Objections

6. Claim 1 is objected to because of the following informalities: "process.." (there are two periods). Appropriate correction is required.

Art Unit: 2822

7. A series of singular dependent claims is permissible in which a dependent claim refers to a preceding claim which, in turn, refers to another preceding claim.

A claim which depends from a dependent claim should not be separated by any claim which does not also depend from said dependent claim. It should be kept in mind that a dependent claim may refer to any preceding independent claim. In general, applicant's sequence will not be changed. See MPEP § 608.01(n).

Independent claims 13 and 14 appear to depend from claim 1. Additionally, independent claims 28, 29 and 30 appear to depend from claim 21. Finally, independent claim 31 appears to depend from claim 30.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 13 and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Nakatani et al (U.S. Patent No. 6,008,576).

In regards to claim 13, Nakatani et al. ("Nakatani") discloses the following:

- a) a substrate (6) (See Figure 2);
- b) emitter (3a) disposed on the substrate (See Figure 2); and
- c) circuitry for operating the emitter formed on the substrate with the emitter (See Figure 3).

Art Unit: 2822

In regards to claim 28, Nakatani discloses the following:

a) an integrated circuit including the emitter (3a) wherein the emitter emits a visible light source (See Figure 3); and

b) a lens (8) for focusing the visible light source, wherein the lens is coated with a transparent conducting surface to capture electrons emitted from the emitter (See Figure 3).

10. Claims 14, 16, 17 and 30-33 are rejected under 35 U.S.C. 102(b) as being anticipated by Xia (U.S. Patent No. 6,034,479).

In regards to claim 14, Xia discloses the following:

a) the emitter (13) capable of emitting energy (See Figure 1);

b) an anode (18) structure capable of receiving the emitted energy and generating at least a first effect in response to receiving the emitted energy and a second effect in response to not receiving the emitted energy (See Figure 1 and Column 3 Lines 55-63).

In regards to claim 16, Xia discloses the following:

a) electronic device is a display device (See Column 1 Lines 29-32);

b) the anode structure is a display screen that creates a visible effect in response to receiving the emitted energy (See Column 3 Lines 55-63).

In regards to claim 17, Xia discloses the following:

a) display screen includes one or more phosphors operable for emitting photons in response to receiving the emitted energy (See Column 1 Lines 37-43).

In regards to claim 30, Xia discloses the following:

a) an integrated circuit including the emitter (See Column 1 Lines 29-43); and

b) a focusing device for converging the emissions from the emitter (See Column 1 Lines 29-43).

Art Unit: 2822

In regards to claim 31, Xia discloses the following:

- a) a microprocessor (33) (See Figure 3);
- b) the electronic device coupled to the microprocessor (See Figure 3); and
- c) memory (31) coupled to the microprocessor, the microprocessor operable of executing instructions from the memory to transfer data between the memory and the electronic device (See Figure 3).

In regards to claim 32, Xia discloses the following:

- a) electronic device (34) is a storage device (See Figure 3).

In regards to claim 33, Xia discloses the following:

- a) electronic device is a display device (See Figure 3 and Column 3 Lines 50-53).

11. Claim 29 is rejected under 35 U.S.C. 102(b) as being anticipated by Gibson et al. (U.S. Patent No. 5,557,596).

In regards to claim 29, Gibson discloses the following:

- a) an integrated circuit (100) including the emitter (102 and 104) wherein the emitter creates an electron beam current;
- b) a storage medium in close proximity to the emitter, the storage medium having a storage area being in one of a plurality of states to represent the information stored in that storage area (See Column 2 Lines 10-15);
- c) an effect is generated when the electron beam current bombards the storage area (See Column 2 Lines 15-20);
- d) the magnitude of the effect depends on the state of the storage area (See Column 2 Lines 15-20); and
- e) the information stored in the storage area is read by measuring the magnitude of the effect (See Column 2 Lines 15-20).

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Simmons et al. (U.S. Patent No. 5,825,049).

In regards to claim 1, Simmons discloses the following:

- a) an electron supply (34) (See Figure 1);
- b) a cathode layer (22) (See Figure 1); and
- c) a tunneling layer (27) disposed between the electron supply and the cathode layer (See Figure 1).

In regards to claim 1, Simmons fails to disclose the following:

- a) the electron supply, cathode layer, and tunneling layer have been subjected to an annealing process.

However, the limitation of "subjected to an annealing process" makes it a product by process claim. The MPEP § 2113, states, "Even though product -by[-] process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

A "product by process" claim is directed to the product per se, no matter how actually made, *In re Hirao and Sato et al.*, 190 USPQ 15 at 17 (CCPA 1976) (footnote 3). See also *In re Brown and Saffer*, 173 USPQ 685 (CCPA 1972); *In re Luck and Gainer*, 177 USPQ 523 (CCPA 1973); *In re Fessmann*, 180 USPQ 324 (CCPA 1974); and *In re Marosi et al.*, 218 USPQ 289 (CAFC 1983) final product per se which must be determined in a "product by, all of" claim, and not the patentability of the process, and that an old or obvious product, whether claimed in "product by process" claims or not. Note that Applicant has the burden of proof in such cases, as the above caselaw makes clear.

14. Claims 2-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Simmons et al. (U.S. Patent No. 5,825,049) in view of Potter (U.S. Patent No. 5,703,380).

In regards to claim 2, Simmons fails to disclose the following:

a) tunneling layer is a metal cluster dielectric.

However, Potter discloses layers of alloys of titanium and tungsten (See Column 6 Lines 12-16). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include layers of alloys of titanium and tungsten as disclosed in Potter because it aids in providing good ohmic contact.

In regards to claim 3, Simmons fails to disclose the following:

a) tunneling layer is a metal cluster dielectric selected from the group consisting of TiO_x , TaO_x , $WSiN$, $TaAlO_xN_y$, $TaAlO_x$, and AlO_xN_y .

However, Potter discloses layers of alloys of titanium and tungsten (See Column 6 Lines 12-16). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include layers of alloys of titanium and tungsten as disclosed in Potter because it aids in providing good ohmic contact.

In regards to claim 4, Simmons fails to disclose the following:

a) cathode layer is selected from the group consisting of platinum, gold, molybdenum, tantalum, iridium, ruthenium, chromium, and alloys thereof.

However, Potter discloses layers of gold, tantalum and molybdenum (See Column 9 Lines 23-37). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include layers of gold, tantalum and molybdenum as disclosed in Potter because it aids in providing good electromigration properties.

15. Claims 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Simmons et al. (U.S. Patent No. 5,825,049) in view of Chuman et al. (U.S. Patent No. 6,023,124).

In regards to claim 5, Simmons fails to disclose the following:

a) emission current of greater than 1×10^{-2} Amps per square centimeter.

However, Chuman et al. ("Chuman") discloses an emission device that has an emission current greater than 1×10^{-6} Amps per square centimeter (See Column 2 Lines 17-28). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include an emission current greater than 1×10^{-6} Amps per square centimeter emission as disclosed in Chuman because it aids in providing a high luminance.

In regards to claim 6, Simmons fails to disclose the following:

a) emission current of greater than 1×10^{-1} Amps per square centimeter.

However, Chuman discloses an emission device that has an emission current greater than 1×10^{-6} Amps per square centimeter (See Column 2 Lines 17-28). It would have been obvious

Art Unit: 2822

to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include an emission current greater than 1×10^{-6} Amps per square centimeter emission as disclosed in Chuman because it aids in providing a high luminance.

In regards to claim 7, Simmons fails to disclose the following:

- a) emission current of greater than 1×10^{-6} Amps per square centimeter.

However, Chuman discloses an emission device that has an emission current greater than 1×10^{-6} Amps per square centimeter (See Column 2 Lines 17-28). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include an emission current greater than 1×10^{-6} Amps per square centimeter emission as disclosed in Chuman because it aids in providing a high luminance.

16. Claims 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Simmons et al. (U.S. Patent No. 5,825,049) in view of Liu et al. (U.S. Patent No. 6,118,136).

In regards to claim 8, Simmons fails to disclose the following:

- a) tunneling layer has a thickness less than about 500 Angstroms.

However, Liu et al. ("Liu") discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include a tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

In regards to claim 9, Simmons fails to disclose the following:

- a) tunneling layer has a thickness less than about 250 Angstroms.

However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include a tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

In regards to claim 10, Simmons fails to disclose the following:

- a) tunneling layer has a thickness less than about 100 Angstroms.

However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include a tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

In regards to claim 11, Simmons fails to disclose the following:

- a) tunneling layer has a thickness of about 50 Angstroms.

However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include a tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

In regards to claim 12, Simmons fails to disclose the following:

- a) tunneling layer has a thickness within the range of 50 to about 250 Angstroms.

However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include a tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

17. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Xia (U.S. Patent No. 6,034,479) in view of Gibson et al. (U.S. Patent No. 5,557,596).

In regards to claim 15, Xia discloses the following:

a) reading circuit (40) (See Figure 4).

In regards to claim 15, Xia fails to disclose the following:

a) electronic device is a mass storage device and the anode structure is a recording medium.

However, Gibson et al. ("Gibson") discloses a memory device that has an anode storage area (See Column 2 Lines 1-9). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Xia to include a storage medium as disclosed in Gibson because it provides a medium to store data.

18. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Simmons et al. (U.S. Patent No. 5,825,049).

In regards to claim 21, Moyer discloses the following:

a) an electron supply layer (13) (See Figure 1);

b) an insulator layer (15) formed on the electron supply layer and having an opening defined within (See Figure 1); and

c) a cathode layer (14) (See Figure 1).

In regards to claim 21, Moyer fails to disclose the following:

- a) a tunneling layer formed on the electron supply layer in the opening.

However, Simmons discloses a tunneling layer (See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a tunneling layer as disclosed in Simmons because it aids in providing a layer for electrons to travel.

- b) the emitter has been subjected to an annealing process to increase the supply of electrons tunneled from the electron supply layer to the cathode layer for energy emission.

However, the limitation of "subjected to an annealing process" makes it a product by process claim. The MPEP § 2113, states, "Even though product -by[-] process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

A "*product by process*" claim is directed to the product per se, no matter how actually made, *In re Hirao and Sato et al.*, 190 USPQ 15 at 17 (CCPA 1976) (footnote 3). See also *In re Brown and Saffer*, 173 USPQ 685 (CCPA 1972); *In re Luck and Gainer*, 177 USPQ 523 (CCPA 1973); *In re Fessmann*, 180 USPQ 324 (CCPA 1974); and *In re Marosi et al.*, 218 USPQ 289 (CAFC 1983) final product per se which must be determined in a "*product by, all of*" claim, and not the patentability of the process, and that an old or obvious product, whether claimed in "*product by process*" claims or not. Note that Applicant has the burden of proof in such cases, as the above caselaw makes clear.

In regards to claim 22, Moyer discloses the following:

a) emitting photons in addition to the electron emission (See Column 3 Lines 2-3).

19. Claims 23 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Simmons et al. (U.S. Patent No. 5,825,049) and Potter (U.S. Patent No. 5,703,380).

In regards to claim 23, Moyer fails to disclose the following:

a) tunneling layer is a metal cluster dielectric.

However, Potter discloses layers of alloys of titanium and tungsten (See Column 6 Lines 12-16). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include layers of alloys of titanium and tungsten as disclosed in Potter because it aids in providing good ohmic contact.

In regards to claim 25, Moyer fails to disclose the following:

a) a) tunneling layer is a metal cluster dielectric selected from the group consisting of TiO_x , TaO_x , WSiN , TaAlO_xN_y , TaAlO_x , and AlO_xN_y .

However, Potter discloses layers of alloys of titanium and tungsten (See Column 6 Lines 12-16). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include layers of alloys of titanium and tungsten as disclosed in Potter because it aids in providing good ohmic contact.

20. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Simmons et al. (U.S. Patent No. 5,825,049) and Chuman et al. (U.S. Patent No. 6,023,124).

In regards to claim 24, Moyer fails to disclose the following:

a) emission rate greater than about 0.01 Amps per square centimeter.

However, Chuman discloses an emission device that has an emission current greater than 1×10^{-6} Amps per square centimeter (See Column 2 Lines 17-28). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include an emission current greater than 1×10^{-6} Amps per square centimeter emission as disclosed in Chuman because it aids in providing a high luminance.

21. Claim 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Simmons et al. (U.S. Patent No. 5,825,049) and Liu et al. (U.S. Patent No. 6,118,136).

In regards to claim 26, Moyer fails to disclose the following:

a) tunneling layer has a thickness less than 500 Angstroms.

However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

In regards to claim 27, Moyer fails to disclose the following:

a) the tunneling layer has a thickness between about 50 Angstroms and about 250 Angstroms.

However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a

tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

22. Claims 34 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Huang et al. (U.S. Patent No. 5,702,281) and Simmons et al. (U.S. Patent No. 5,825,049).

In regards to claim 34, Moyer discloses the following:

- a) an electron supply surface (See Figure 1);
- b) an insulator layer (15) formed on the electron supply surface and having a first opening defined within (See Figure 1);
- c) a conductive layer (18) (See Figure 1); and
- d) a cathode layer (See Figure 1).

In regards to claim 34, Moyer fails to disclose the following:

- a) an adhesion layer disposed on the insulator layer, the adhesion layer defining a second opening aligned with the first opening.

However, Huang et al. ("Huang") discloses an adhesion layer (See Column 3 Lines 60-67). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include an adhesion layer as disclosed in Huang because it aids in providing improved adhesion among the layers.

- b) a tunneling layer formed on the electron supply layer within the first, second, and third openings.

However, Simmons discloses a tunneling layer (See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a tunneling layer as disclosed in Simmons because it aids in providing a layer for electrons to travel.

In regards to claim 40, Moyer discloses the following:

a) emitting photons in addition to the electron emission (See Column 3 Lines 2-3).

23. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Huang et al. (U.S. Patent No. 5,702,281) and Simmons et al. (U.S. Patent No. 5,825,049) and Chuman et al. (U.S. Patent No. 6,023,124).

In regards to claim 35, Moyer fails to disclose the following:

a) emission rate of about .1 to about 1.0.

However, Chuman discloses an emission device that has an emission current greater than 1×10^{-6} Amps per square centimeter (See Column 2 Lines 17-28). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include an emission current greater than 1×10^{-6} Amps per square centimeter emission as disclosed in Chuman because it aids in providing a high luminance.

24. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Huang et al. (U.S. Patent No. 5,702,281) and Simmons et al. (U.S. Patent No. 5,825,049) and Potter (U.S. Patent No. 5,703,380).

In regards to claim 36, Moyer fails to disclose the following:

a) tunneling layer is a metal cluster dielectric selected from the group consisting of TiO_x , TaO_x , WSiN , TaAlO_xN_y , TaAlO_x , and AlO_xN_y .

However, Potter discloses layers of alloys of titanium and tungsten (See Column 6 Lines 12-16). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include layers of alloys of titanium and tungsten as disclosed in Potter because it aids in providing good ohmic contact.

Art Unit: 2822

25. Claims 37-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Huang et al. (U.S. Patent No. 5,702,281) and Simmons et al. (U.S. Patent No. 5,825,049) and Liu et al. (U.S. Patent No. 6,118,136).

In regards to claim 37, Moyer fails to disclose the following:

a) tunneling layer has a thickness between 50 to 250 Angstroms.

However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

In regards to claim 38, Moyer fails to disclose the following:

a) tunneling layer has a thickness of about 100 Angstroms.

However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

In regards to claim 39, Moyer fails to disclose the following:

a) tunneling layer has a thickness of less than about 500 Angstroms.


However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a

tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

Conclusion

26. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 703-305-3743. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 703-308-4940. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722 for regular and after final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ML
May 2, 2002


CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800